

James Sedell Interview

VR: Jim, thank you for being here with us. Tell us a little about your early life, and especially how you got interested in aquatic ecology.

JS: I was conceived on the banks of the Rogue River in Southern Oregon, and my dad liked to fish, and so we—and I grew up in central Oregon on the ?Shoots? and the ?Matowis?. So learning to fly fish was probably my earliest recollection of streams and how they were a little different and what not, and the bugs. And I was more interested in catching fish, but still, it was real formative. And then I would dam up little streams, and my idea of a good time was to walk from ?Redmann? to the ?Pashoots? River, play around in the side channels, cook marshmallows and hot dogs over a fire, and walk five miles back to town. My brother and I did that from when we were ten until we were about fourteen and moved from Redmann. At that time you didn't think about little kids out on a highway. I mean, you just did it. So I got to college and I was a philosophy, physical science major. I was going to be a lawyer. My junior year one of my good friends walked the beach and he could tell me all about these algae and all these little limpets and snails and critters and I thought, "Boy, that beats the hell out of a law library." And so I applied to a whole bunch of places, and I'd never seen the east coast. Pittsburgh accepted me, and their chairman at the time was from a little liberal arts college like I came from, and he wanted to see more of that there. So I got there, and that's where I met Ken Cummins and became—and really got interested seriously professionally in streams because of Ken. And so I became his student, and by the time he got through all these ?comps? and orals and all that he ups and leaves for Michigan State. I wasn't going to go through all that stuff again, so I stayed there and worked with Bill ?Koffman?, who had come back from a post-doc in Germany. So I finished up at University of Pittsburgh, but in the meantime I kept in very good touch with Ken, and went to ?Gull Lake? To process my work. So I stayed very closely touched with ?Wetzel? and ?Cummins? That really launched me on a track. And then I applied for jobs, and Jim Hall and Norma Anderson were looking for someone to ramrod the International Biological Program stream and aquatic stuff. So I applied and I got that. Then quickly—but before I went there, I said, "Well I need to go meet some people that are doing interesting watershed stuff", and one of those was ?Stuart Fisher?. And the other one was ?Robin Binot? And so just as I'd finished and before I headed west I went up and spent three days with Stuart there at Amherst. And a very generous and very gracious—cause I said, "Well I think I'd like to try to do something like you're doing, only on a coniferous forest in the West." And so we talked a bunch about that and pitfalls. And then I went to ?Stroud? And that was a real eye-opener. I mean these people had all these gizmos at the time, and knew all about these bugs, and were taking it more from a community college-y approach, very different from what Stuart had done. And it was just very exciting there. And Rob would kinda do his thing, and all the time he was smoking a pipe, and would walk the stream and wave his arms, and it was real exciting. And so then I came back to Oregon at Oregon state, and what got me was that we had all these parts, but we didn't have a story. We didn't hang within a coniferous forest ?biome?. We had a fish story, we had an insect story, and that. And so Stuart's stuff, we just said "Okay, I'm going to find a little watershed ?ten? and we're going to a

carbon budget. And at least that'll connect us to the forest. And that'll be a place to start. And that'll be something systemically that we can hang a lot of the community work that Norm and Jim did. And at the time, ?Jack Lyford? Was into mosses. And so that's what got started. And probably the best thing that happened was that both Jim and Norm went on sabbatical, because in the time they were on sabbatical, then I could work with ?Jerry Franklin? And ?Dick Werren? we totally rearranged what we were doing. And then that sustained itself through a long time. We got ?Frank Triska? There and did a lot of stuff. But that's how I really got into it, was fly fishing and walking and chasing crawdads in the "Shoots River".

5:02

VR: You've certainly had a broad professional career, in terms of working at different places, and you've been in industry, you've been in academia, you've been in government. How did these influences affect how you view streams and stream management, especially?

JS: Well I think the early ?dear the katims? Going back to Pittsburgh, certainly opened my eyes to deciduous Eastern forest streams. Because they were very different from anything I'd seen. I was used to mountain streams in the west. And white water, pretty pristine. And these were highly developed agricultural streams, or highly urbanized streams. And so it was a real eye-opener. And I'd looked for ?wreckage? And when in Pennsylvania we'd go to streams in ?Heart's Content? Or ?Crook's Forest? And see how these remnant old white pine forests might interact. And that was all kind of neat, and like I say, the ?node? and ?Strautzen? really opened my eyes to a whole bunch of other possibilities, and Ken was into his ?trophic? dynamics and the ?gills? So that got me going. And when we got back, that whole science part got me thinking systems with the IBP, with the modelers, the nutrient cyclers. And Oregon State had made a tremendous effort. They decided their future would be with post-docs. And so I was one of those. And ?Fred Swanson? Was one, and "Frank Triska?. ?Kermit Cromac?, ?Check Grier?, and a bunch of those folks have gone on and done really nice things, and then ?Stan Gregory? Was there as a student. I spent the first six months trying to get rid of ?Stan Gregory?. And it was the best thing that ever happened to me, and surely to the program that we never did. I tell that just out of fairness, because he was taking money that I needed. And he was at the time doing something very different. And we laugh about the relevance of what he was doing now. So that was it. And then the continuum came along. And that opened our eyes to start thinking bigger about comparisons, along different ?size?, about a gradient of streams. A tremendously exciting time. If science is about discovery and creativity, both those experiences were it. But the continuum more so. That truly was an up-from-the-ashes creative effort that everyone then started to contribute both to the robustness of the ideas and to the execution of trying to get it to start. I had some personal family problems that really stemmed from the continuum, and so I dropped out, and I needed to get a bigger income to support myself and my family. And that's when I went to ?Werehauser? And at the time, it was a shock to everyone at Oregon State that I left academia and went into industry. But I needed, for very real, financial reasons. But the thing that got me into touch with was ?Pete Bisson? And all

this industrial-force land that had cut over. And really the very best most productive land in the West was private industry land. So I saw things I'd never seen before, and I could then start to look at the extremes of the disturbance. And that got me thinking about integrating some of this theory into the management and the importance of some of the early stuff we were doing into that. And then with government it became apparent I wasn't really an industry biologist at heart. The industry couldn't decide whether they really wanted a scientist, in which we had certain rules to play by, of transparency and give-and-take, and open debate, versus a gladiator, in which you hire a consultant to advocate technically a point of view for them. And what brought it to a head was they didn't want me to publish the whole story. They liked this part of the story. And I said, "Wait. Either publish the whole thing, 'we'll put you in jail, and you have a science 'Cadray', or you don't." And so that drove "Werehauser" after I left to allow this and then "Bilby" who replaced me to publish stuff that I am sure those execs never bothered reading but are just amazing, very very good science papers at all. And then that got me into the 'riparian' area. Cause that was what was by the industry. What was the role of 'riparian' areas around streams. And we'd been looking at the role of forests and bigger streams in that. And then when I went to the forest service. That started to get me back with 'Fred Swanson' for one, and started thinking more about geomorphology and then applying some of the basic sciences to what was fairly much a fish habitat program. And while my slant then still continued to still be on the fish habitat, it was more towards the 'riparian' end in the basic science into it. But when I joined the forest service was in the same year that Mount St. Helens exploded. And that allowed me to coordinate the aquatic work around St. Helens. And we brought in a bunch of oceanographers. Some had been in origin of life discussions--'John Barris' And they were very much into these primitive 'archy-bactors' And then anaerobic things. And I know that we would never have looked at that if I hadn't been around the 'Rick Larsons' and the 'Klugs' and other folks and 'Tom Bot' During the continuum. And there was amazing, wildly, exciting time. But that got into disturbance at still another extreme. And then how do you recover from that disturbance? And then, like I was saying earlier in the interview, that really everyone said, "Well large wood only plays a part in really small streams". And I felt like, no, wherever there was a forest at a bank, a river, it had to interact in some way, and I could show it all the way through the Mississippi. European rivers went a couple years before ours. So I started to compile historical reconstructions of rivers. The 'Polammet' river is probably the best of what I did. And then splash dams. Just history of how rivers got there, and how what we were seeing wasn't what the final end point might be even though the water looked clear. It had been really changed.

12:00

VR: How did you get involved in the river continuum.

JS: Well I think a lot of it from my point of view was because I was groping for some overarching way to approach streams in the biome. And at Oregon State there you had 'Charles Warren', and I couldn't understand him. I mean, it's not that I disliked Charles at all. I didn't. It was just that intellectually, I couldn't figure out what he was doing. And then 'Resnet' I couldn't translate it over into the exciting things that 'Fred

Swanson? And ?Jeret Franklin? And all those students were doing. And so we brought in a whole bunch of people to help me sort through what was—to see if he had something that I could grab onto, and if not we could interface him. And we started to ?cook? about a lot of ideas after we'd come out and shake our head that we couldn't understand what was going on in the room before. And that started to get things going, and through various workshops of which probably only ?Burt Cushing? Is recorded. We started to get together. And that's when I went—Jerry Franklin left as coordinator of the coniferous forest biome and took a stint for a year or two as a program director in ecology at NSF. So I called Jerry and I said, “Hey, I think that if we're interested in stream groups getting together around the country, which was part of the inner biome comparisons. There's a good group of people. What about a grant for looking and seeing that there's something there.” And so we put a small proposal together and it got funded by the National Science Foundation to meet to start to discuss, and I think the others might have said we floundered around and whatnot until we had a meeting there at either ?Stroud? or ?Kellogg?. I forget which one. Suddenly Robin started waving his arms and letting it go. We all knew that he had a story, and we couldn't pull it from him. And he was really careful at guarding it, and finally he just let it loose. And it was a great story. I mean, that was the foundation. And then we just went. We just knew we had to do something, and that gave us the framework to hang up a clothesline.

14:32

VR: When you finally did start working in the RCC, was this the main focus of your research, or were you doing a lot of other things.

JS: No, I was doing a lot of other things. My job in a lot of things was to get the money and keep the crews going. And I would write the proposals for the aquatic stuff for the ?at? We hired ?Frank Triske? We had ?Stan Gregory? On. We had two or three technicians going there. So we were doing a carbon nitrogen budget. And we were doing all the stock stuff, leaf packs, I think we published those. And so I was keeping that going, and then when the river continuum came on, then I started sliding that onto Frank and to ?Jim Hall? And really stand to kind of finish up and I moved over to a rut in the RCC. But I still had these biome responsibilities at the time.

15:37

VR: Let me ask you about the different participants in the river continuum concept. What was their role, and what do you think the main thing that they focused on, or they contributed. Let's put it that way. How about ?Robin Benot?

JS: Oh, ?Benot? was certainly the creator of the concept, and he'd been thinking about it through his bugs and temperature and that. But also he's one of the best naturalists we had. He's curious about forests. He'd ask questions about history. He'd thought about well, what was the view of a stream from a horse's back, cause that's how the early descriptions of streams were, versus walking. You know, it never dawned on me that being five feet higher would give me a different—I mean it would, but I wasn't thinking

about that. He was thinking about just little things. So he was very curious about the world. And very creative. So he had that idea, and at the same time he had a certain amount of rigor, particularly as he approached the bugs. He had such a wealth of work with muscles and ?TVA? and had been on all these channelization studies, and so he'd really seen a lot of things going around. And particularly he knew farm, these woodlot farmland streams. Very different from anything I'd read with the ?Solar? conservation servicer people that played with that. So he definitely was to me the creative leader of the bunch, and I really resonated very well with Rob, when we could wave our arms, and it was just a joy to be around. Just a real joy.

17:26

VR: How about ?Burt Cushing?

JS: Burt Cushing was probably one of our more unsung members up there because he was from a high overhead place in ?Battel? But he had a lot of experience with the desert biome and then at ?Battel? working with desert spring streams. And he knew a lot about isotope use and chambers, but his strength was a good follow through. He would do what he said he was going to do, and in retrospect, he was essential for ?Mitchel? maintaining his sanity. Mitchel would get exasperated with Robin and I because we didn't follow through or we wouldn't buckle down and do things. And so Burt in my opinion played a key role as a ?brokering? when relationships were strained and he'd kind of work in on his own way, but a lot of it was with Ken and with Wayne, keeping them in the game and going. And like I said, he's technically no slouch. So he was really essential. And then in the after part, when essentially Robin and I weren't doing a whole lot, he was essential in the follow-through, for getting things done with Wayne. That's the way I saw it. Plus he's just one of the great gentle people in aquatic ecology. He had a huge network, and he cultivated in it. And it wasn't through science expertise. He understood science, but he felt that personal relationships were real important. And he still does. I mean that's, to me, why people still go to him.

19:31

VR: What about ?Ken Cummins?

JS: ?Ken Cummins? Was probably the best known of the stream ecologists of all of us. Certainly the world, only a certain amount of insiders knew about Rob and I, I think. But Ken Cummins had come out with some ?trophic? levels, and had a number of workshops ?there a time at tuning? And the energetics book he did, and so he was really climbing. And he had a lot of great ideas about insects. Again, he's no slouch as a naturalist. And again, I look at him as the first mentor I had in streams. And so he brought a maturing idea of streams, still bug-centric and leaf-pack-centric at the time. And then I think really while we kind of beat up a little bit on ?Wetzel?, ?Wetzel's? look at C-14's and carbon cycling in the lakes helped influence some of the technique's development, certainly that they were using at the lab there at ?Cull Lake with the internash? But he brought a

credibility to us, and a follow-through. And he had a lot of ideas, also. So he was a main player.

20:57

VR: The fact that you had been a student. Was that ever awkward.

JS: No! Because we kind of made this split. And he'd gone to Michigan State. And he'd kept in touch, and again a very generous a person. He'd open his lab. He and ?Bob Peterson? put me up. Cause I didn't have any money. And I'd go there for several days and I would use ?Bob Wetzel?'s equipment to do it. And so again, very generous, very open, very open with ideas, didn't hide anything. So you always felt like you were being treated with an equal respect. And then when I got out to Oregon State, you could start to carve out a little space of your own. And I felt like I had space of my own. I was doing things that weren't in competition. In fact, a lot of what I did early on was just a copycat of what ?Stuart Fisher? Had done, or the leaf-pack stuff, only we'd use needle-packs, and we'd look at it a little differently, but the same thing. And so I felt like, okay, that was a way to get started in the field there, and he was very important. And then I think that what happened was we got him out on a sabbatical in the early days of the continuum and then eventually he came back as a professor there at Oregon State, and that was really a plus. But it never felt awkward, because I wasn't there like ?Bob Peterson? Was, where it was a post-doc and he kind of grew up with his thesis. Cause my thesis got started and then Ken went and really Dan Nelson was my thesis advisor from Oak Ridge. So intellectually, it was a little different spot, even though we could talk about it. So we developed a pretty good relationship, I felt. And still do. Any of these people I feel like I could call in the middle of the night, and they'd grumble and roar at me, but they'd open the door.

23:01

VR: What about ?Wayne Mitchell's? contributions?

JS: Oh, Wayne Mitchell—The Bear. In any science project of this scale, you need a variety of people. And at the start you need the idea generators and that, and then you need the implementers and the data collectors and that, and analysts, and then you need the synthetic, the synthesis people at the end. They aren't always the same people. And so Wayne was a good thing cause he could keep us honest. He was the Lorax of the river continuum. If Robin came up with the idea, Wayne spoke for the concept. And he spoke because he followed through on the papers, and he controlled and beat up and yelled and got angry with us, and really was the general that bashed heads to get the paper out of them, and if people didn't want to pay he'd just go ahead and do it. And so that was an unfair burden. He didn't ask or aspire to that. But by sheer force of his personality, and he was inclined to analyze and get it out, he did. And so I would consider him the Lorax of the continuum. I mean, we would have had that. The Lorax spoke for the trees, and Wayne spoke for the concept. And he did that in his writing. He did that when we had to do a defense of something with like the paper in the Canadian journal where a ?Statzner?

and ?Higgler? and ?Weirmar? He had to organize and galvanize the forces to go do it. And it's reflected. I think that if you looked at symposium around Europe and that, they weren't calling on Robin or anyone else. They were calling on Wayne. And so Wayne would go over to the British Ecological Society, or Wayne would go to some of these other meetings, and really represent us. And I think ten years or so after, he would get a tag, and unfairly in many ways, of being very defensive about the continuum. He was really on the front lines on the international banquet circuit, so to speak, defending this, and looking at the nuances and that. So to me, we wouldn't be here talking to you if it hadn't been for ?Mitchell? And so he was really important. The other one I'd like to talk about is Peterson. Peterson and I started graduate school together at Pittsburg. And then when Ken left and went to Michigan state, he went to Michigan State too. And he was always a—Milo the Bull, we always called him. Very strong, physically strong person, very intense person in personality. But he really liked technique and methods. And he was a good experimentalist. And when Ken would tell you about something, Bob would think about experiments that could test this. So he was an excellent experimentalist. But he really had a flare—he liked the statistics. He liked the analytical part. Well that was not—So one of these meetings where we had them all out and he came out and where I got crossways really with Bob was we were up drinking beer and I was showing him the work in the ?Andrews? forest and what we were thinking and trying to get his ideas on how we would proceed there. And he just made a comment, and probably he didn't even remember the comment, cause he'd had a beer too, that I would never amount to anything in science. And that pissed me off. And so then when he went on to Sweden and post-doc-ed there. Then they said they were going to bring him on as a post-doc. I objected. But then we decided that there wasn't anybody better to do that, so we'd do it. So there was always a kind of a clash of the egos there. And we did it both physically, when we'd wrestle, and verbally. So there was a tension that Wayne, and Ken, and Robin were always—and he was far better analytical skills than I ever had or ever aspired to have. I mean, he was essential to knowing that he needed data and how to go about analyzing it. So we kind of split apart. And part of it is when you're into data sheets and a rigid analysis, you couldn't see this rich tapestry we were trying to describe with this really simple river continuum. And that always frustrated me. That we needed to make some very real but narrow choices to describe what we were doing and then go do it, and to me that wasn't all there was. The richness to me and the excitement was seeing all this variability, and then how do you accommodate that. So it was the intellectual excitement that stimulated. And he was rightly so went after the product. And it wasn't that he didn't think about those ideas and didn't have good ideas. That wasn't the point. We separated and we really didn't talk to one another. And then at a ?Dom? conference ?Cliff Dom? Said, "This is nuts". He'd gone to Sweden, and he knew there was tension between Bob and I. He said, "Jim, this is nuts. You have to bury the hatchet, let go of things." So we met and had dinner, and all this was about ten years later, and buried the hatchet. But there was still some ??? And then he came back to the US and had his aneurism and was in the hospital. And they were trying to decide whether to send him back to Sweden or it was more advantageous for the rehabilitation to be in the states. So I made a special trip there. And I called ?Marsof? and others to see if he would take visitors and all and he said, "Yeah, he's kind of depressed. It would be nice to have that." So I walked in and the nurses had changed and they said, "Well who are you? We only

allow family in.” Well I said, “I’m his brother.” And walked into the place. And they led him into the room, and from what I gather afterwards, from talking to Ken and others, he was very lucid. And for two hours, he was very lucid. And he looked at me, and I introduced myself formally. I didn’t know whether he would recognize me or not. And he says, “Ah, Jim Sedell. You always show up at the most interesting times.” And that kind of set the tone for what I thought was for me a major closure with something that had ruptured. Because I used to stay at his house, and we got his cat, a Siamese cat, things like that. So that was extremely important, to come to closure with another main player in the continuum. So lots of human relations, and not just science that goes into these things, I think.

30:45

VR: Do you think that people outside the continuum understood the roles that each of you played?

JS: I think they did in some ways. I mean I could see that I was energetic and waved my arms a lot. And they appreciated Robin when he got up. And I think that as time went on they got a much clearer view of who stayed engaged and who followed through. And then there are certain crowds that you play to. I mean, Robin in the northeast and the east that may not have appreciated what the folks in the west did. And we in the west played it towards where we were. But I think the science community has got it pretty figured out now, as to what the kinds of roles that were. But they might have known in the beginning.

31:42

VR: Were there some directions you would have liked to have seen the RCC go into? I know you left it early. But were there some things that really should have been done that weren’t done or directions that should have gone in that weren’t?

JS: Oh, yeah. And I think it got into that one paper where we showed the canyon regions and the different ridge types that could explain some different kinds of processes. And I would have liked to have seen us take a little stronger look geomorphically. And we were heading towards some of that. And again, Robin really resonated also with Fred Swanson. And Fred Swanson had a really great view. In fact a lot of his both spatial and temporal scale stuff? Christopher Zell? Formalized. But that really came from Fred’s geomorphology class at Oregon State. And so I would’ve liked to have followed up on some of that. I was less interested in the bugs at that time, even though I got started in aquatic insects. Ken and Robin were really into that. So I was into taking a look at the bigger picture, looking at the geomorphology and some of the transport kind of things.

32:59



VR: Large spin-offs of the river continuum like the serial discontinuity hypothesis and some of the others were really modifications of the river continuum concept. Did it bother you that they took the basic idea and they changed the name.

JS: Well, actually no. I mean, I would get exasperated with some of the literalness that was going on. But I felt, whoa! You know? People are responding. And if anything we wakened some creative juices in a whole bunch of other different people. And they were scrambling for taking their real life experience and trying to explain it in a little broader context than their papers had indicated before that. So the way I looked at it, it was more satisfying that. Hey, we knew we had holes and limitations in what we did. So now people were trying to shore it up and see what they could do. But I didn't think any of them ever got to that overall picture, that world view, that we laid out very simply. They took a piece of it and explained it. And some explained it a lot better than us. And I guess that's what science is all about. Stimulating ideas and people follow through and take little different attacks. And maybe we won, maybe we didn't. Maybe we're going to change it. We just change our fairytale.

34:33

VR: Were you pleased with the way it's been used in management and application?

JS: Well, it's often cited in major regional assessments and EISes. But it's really limited as to how you'd use it in a management sense. Cause a management sense is all, other than if it's not working and it should be working. Like there are no trees where there should be trees. You've got a problem. And so you could use it to explain the foundations. It was extremely important in explaining to managers why very robust ?riparian? forests in ?riparian? areas were important to streams. Not just to salmon, but to a healthy river down where it went by a town or something. And until then we didn't have that. We were really just focused in on a site where a logging project or a ?show? or something like that. But this allowed us to talk about the whole network. And then you could see that big streams still needed something. And little streams, you could argue, needed even more because they were a lot more intimately connected to the stream than the bigger stream. And so I think that gave us a framework. I don't think it changed someone's mind into leaving a hundred-foot buffer or a two-hundred-foot buffer. But it allowed us to hang what we were trying to do with an explicit thing to a framework of how a stream or river operated. If we wanted to sustain it, we had to keep it that way.

36:20

VR: This is going to be a tough question. You've had really a remarkable career. If you look back over the last thirty-five years, what do you think your greatest contribution as you leave will be?

JS: Well, yeah. What may be what is left may not be what I'm most proud of. In the sense that I think that the continuum certainly ranks as one of my science achievements. I think the IBP work with ?Frank Triske? And ?Stan Gregory? In the old biome that got

the stream team started at Oregon State was a real highlight. And I think that those small-stream studies, that then we rolled into the continuum. Those'd be it. So the getting together with the ?Jerry Franklins? And the ?Stan gregorys? And the ?Fred Swansons? Were really seminal and important parts of my development, that set me up to be an active and contributing participant in the river continuum project. And after that, I think the historical reconstruction work, and the work with large wood. Because nobody was seeing that, and people said, "Well, my job is to go out and publish papers." Well I didn't publish a whole lot of papers. But there wasn't a garden club or a civic group that I didn't tell a story to about large wood and the need for big trees and ?mercinal? trees. And so there was a two year period when I must have given a hundred and twenty talks. A couple a week, on a single story, that we needed to manage streams differently. And that culminated in the Northwest Forest Plan. And in terms of translating science into an ecosystem vision for restoration or sustaining it that was put down in law, that was laid out and saying that's the best translation of science that we can do for ecosystem management at the time. And that was the culmination of the work in the river continuum and the old biome and said, this is what you do if our mission is to sustain fully-functioning streams and rivers in the northwest. And this is kind of what we have to do. And I think that those would rate. And then the historical stuff would point out that when we had been ?priming? streams forever and pulling the wood out of them, and that's just a ?passion? cause I could do that at any library. And I would go and give a talk at Utah State, and I'd go find out who'd done work on the ?Cache? river, and see what it looked like. And it was always the same story. There were a lot of trees. There weren't trees now. There's evidence of wood and/or beaver. And so those'd be my greatest ones. And if I finish out in the legacy, I'd like to finish out with the establishment of some experimental forests, where people in the future would have a chance to do some manipulation of that. But I feel like I've been very blessed and very lucky to have crossed paths and maintained common courses with so many wonderful and bright people.

40:05

VR: Is there some aspect that's given you the most personal satisfaction?

JS: Well I like the history part. I mean personally, I thought that was it. And it always tickles me. ?Stan Gregory's? really doing a wonderful peace of work with ?Dave Folse? On the ?Wilamette? and they remeasured the ?Wilamette? stuff, and I'd done it with just ?Judy Froget? And I'd just done it with a map wheel. And we came out very close when they ?GIS?'ed it. And all-referenced it. The storyline didn't change. Some of the numbers changed a bit as it got more precise. And I felt very good that we didn't blow it with our primitive tools. But I thought the history stuff there, and then I guess ?St. Helen's?, but that was more what it did for me in terms of seeing a cataclysmic disturbance, and nothing that I could have ever thought about or envisioned. And then now twenty-five years later, seeing some incredible recovery and changes as it was reset and now it's starting back.

VR: Thank you very much.